

AMENDMENT

IN THE CLAIMS

Please amend claims 1 and 7-8 as indicated in Appendix A submitted herewith.

REMARKS

Claims 1-3 and 5-16 are currently pending in the captioned application with claims 1 and 7-8 being amended by the enclosed amendment.

Claims 1 and 7 have been amended to recite that the lower limit of the presently claimed copolymer particle diameter as measured by a Coulter Counter is 5 μ m. Support for the claim amendment can be found in originally filed claim 4. Claim 8 has been amended to correct a typographical error.

No new matter within the meaning of § 132 has been included by any of the amendments.

The amended range with a lower limit of 5 μ m is unobvious over the cited references because the known copolymer particles have an average particle size of about 0.02 to about 0.5 μ m and are free of clusters of particles greater than about 5 μ m in

size. The primary reference also teaches away from the present invention because it discloses a colloiddally dispersible copolymer for thin films having uniform thickness whereas the present invention relates to a resin dispersion comprising particles having a much large diameter for suspensions.

Accordingly, Applicants respectfully request the Examiner enter the amendment and to reconsider and allow all claims in view of the following arguments.

1. Rejection of claims 1-14 under
35 U.S.C. § 103(a)

The Office Action rejects claim 1-14 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 3,475,369 ("Blunt") in view of either U.S. Patent No. 3,328,362 ("Roberts et al.") or U.S. Patent No. 5,252,677 ("Tomita et al.") The Office Action states:

Blunt is directed to a resin composition useful as a coating and/or adhesive material for metal, plastic, and cellulosic substrates. Blunt teaches the composition comprises solid particles of an olefin copolymer dispersed in an organic solvent. Blunt teaches the copolymer comprises a first α -olefin of a crystallizable copolymer such as ethylene and a second α -olefin

having 2 to 20 carbon atoms wherein the second α -olefin is present in an amount of 2 to 25 mole percent and the copolymer is prepared with a metallocene catalyst. Blunt teaches the copolymer has a viscosity of 1 to 50 and a crystallinity less than 90%. Blunt teaches the dispersion generally has a solids content of 10-30% (column 1 lines 23-25 and column 2, lines 3-19 and column 3, lines 3-6 and column 4, lines 1-4, 13-16, and 26-31 and column 6, lines 28-49 and 74-75 and column 7, lines 10-19 and column 11, lines 1-3 and 25-28 and column 12, lines 27-34). Blunt is silent as to incorporating (e.g. by grafting) a polar monomer into the copolymer. It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate (e.g. by grafting) into the olefin copolymer taught by Blunt a polar monomer such as one suggested by either one of Roberts or Tomita et al. to form a resin composition having improved adhesiveness. As to the specific amount of polar monomer, one of ordinary skill in the art at the time the invention was made would have readily appreciated determining the optimum amount to give the resin a desired adhesiveness as determining this parameter is well within the ordinary skill of one in the art and would not require anything more than routine experimentation.

Regarding the particle size, Blunt teaches substantially all of the particles are less than 1 micron in their largest dimension (column 2, lines 36-39), and thus, Blunt teaches that at least some of the particles are larger than 1 micron such that the claim limitation is met. Additionally, Blunt teaches the particles have an average particle size of 0.02 to 0.5 microns (column

2, lines 20-27) such that it would have been obvious to one of ordinary skill in the art at the time the invention was made that the average particle size taught by Blunt would have included larger particles and in particular at least some particles having sizes greater than 1 micron. Furthermore, the background of Blunt teaches it was known to form the particles having sizes up to 500 microns and in particular 1-5 microns, the particles being used to form adhesive films wherein films of reduced thickness have small particle sizes (column 1, lines 27-30, 40-43, and 64-68). It would have been obvious to one of ordinary skill in the art at the time the invention was made to experimentally determine/optimize the particle size as a function of the desired thickness of the adhesive film as doing so would require nothing more than ordinary skill and routine experimentation.

Roberts discloses modifying copolymers, including those taught by Blunt, to include a polar monomer. Roberts teaches incorporating a polar monomer into the copolymers improves their adhesiveness (column 1, lines 10-32). Tomita et al. disclose modifying copolymer such as olefin copolymers with a polar monomer such that the adhesiveness of the copolymers is improved. Tomita et al. teach the polar monomer is present in an amount greater than 1% (column 1, lines 8-254 and column 2, lines 59-68 and column 3, lines 1-5 and column 9, lines 40-46 and column 11, lines 49-60).

Regarding claims 2, 3, and 8-10, it is well known in the art to experimentally determine/optimize parameters such as those claimed (e.g. glass transition temperature,

molecular weight distribution, etc.) such that absent any unexpected results one of ordinary skill in the art at the time the invention was made would have readily appreciated experimentally determine/optimizing the claimed variables as doing so would have required nothing more than ordinary skill and routine experimentation.

Applicants respectfully traverse the rejection because all three prongs necessary for a *prima facie* case of obviousness are not present over the newly amended claims. In particular, amended independent claims 1 and 7 recite a graft modified ethylene/ α -olefin random copolymer having a particle diameter measured by a Coulter Counter of 5 to 50 μm . None of the cited references teach a particle size limitation within the claimed range and instead teach much smaller diameters of 0.02 to 0.5 μm and even teach clusters of particles not being greater than about 5 μm .

Moreover, Applicants maintain that the presently claimed range of crystallinity of less than 30% is a non-obvious range of a broader disclosed range. Although Blunt discloses the extremely broad range of a crystallinity of 90% or less, the presently claimed range of less than 30% unexpectedly results in a graft modified ethylene/ α -olefin random copolymer having a

melting point of not higher than 90° C while having high adhesion strength. This unexpected combination of low fusion temperatures and high adhesion strength allows for a film made from the copolymer to be heat sealed at low temperatures.

Turning to the rule, the Federal Circuit held that a *prima facie* case of obviousness must establish: (1) some suggestion or motivation to modify the references; (2) a reasonable expectation of success; and (3) that the prior art references teach or suggest all claim limitations. Amgen, Inc. v. Chugai Pharm. Co., 18 U.S.P.Q.2d 1016, 1023 (Fed. Cir. 1991); In re Fine, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988); In re Wilson, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970).

In the present application, claim 1 recites a resin dispersion comprising:

components derived from ethylene and an α -olefin of 6 to 20 carbon atoms, the content of the ethylene component is in the range of 75 to 97% by mol, and the content of the α -olefin component is in the range of 3 to 25% by mol, each content being based on 100% by mol of the total of both components,

the intrinsic viscosity (η) as measured in decalin at 135°C is in the range of 0.2 to 5.0 dl/g,

the crystallinity as measured by X-ray diffractometry is less than 30%,

the copolymer contains a graft component derived from a polar monomer, and the content of the polar monomer graft component is in the range of 0.1 to 15% by weight and

the particles of the copolymer have particle diameters measured by a Coulter Counter of 5 to 50 μm .

The cited references fail to teach each and every one of the claimed limitations. In particular, the primary reference, Blunt et al. fails to teach that the lower limit of the particle diameter of modified copolymer is 5 μm . Instead, Blunt et al. teaches that substantially all of the particles are less than 1 micron in their largest dimension. See Blunt et al. at col. 2, lines 36-39.

Although the "substantially all" language implies that some particles are larger than 1 μm , Blunt et al. continues that **clusters** of the particles do not approach 5 μm in size. See id.

at col. 6, lines 57-61. Therefore, one of ordinary skill in the art would clearly understand from the teaching that if clusters of the particles do not approach 5 μ m in size then none of the individual particles themselves could approach 5 μ m in size.

Although the background teachings of Blunt et al. disclose that it was known to form particles having sizes up to 500 μ m, Blunt et al. expressly teaches away from the use of large resin particles. Thus, one of ordinary skill who intended to make the presently claimed adhesive having excellent low-temperature, heat-sealing properties which can be used as an adhesive for polyolefins would not have been motivated to use the resin particles within the presently claimed range.

Applicants further note that Blunt et al. is non-analogous art insofar as Blunt et al. relates to the preparation of thin films whereas the present invention relates to adhesives. One of ordinary skill would not have been motivated to combine the teachings of Blunt et al. with graft modification techniques. This difference is further illustrated by the teaching that the copolymer particles of Blunt et al. are colloidal in nature.

Blunt et al. discloses a colloiddally dispersible copolymer which forms a colloidal solution. However, the particles of the

present invention have a larger diameter than those used for a suspension and therefore cannot form a suspension required for the presently claimed resin dispersions. This difference in particle size between the particles of Blunt et al. and the present invention is due to the difference in the objectives between the cited art and the present invention.

For example, Blunt et al. relates to thin films having a uniform thickness and the problem of high viscosity polymers and copolymers preventing formation of thin films. As noted by Blunt et al., the significant feature of the disclosure is to provide for α -olefin copolymers in which all the primary particles have less than 1 μ m in their largest dimension. See Blunt et al. at col. 2, lines 36-40. Therefore, the motivation is to avoid using resin particles having a small diameter.

However, the present invention relates to an adhesive having excellent low-temperature, heat-sealing properties which can be used as an adhesive for polyolefins, and particularly that for polyethylene. Notably, the high viscosity of the copolymers created by the small particles taught by Blunt et al. is not suitable for adhesives because they deteriorate the flowability of the resin. The increased viscosity prevents

proper coating of the resin dispersion as an adhesive during a coating step.

The claimed limitations between the particle sizes of the cited art and the present invention are not mere optimization of results effective variable because the particles of Blunt et al. are not suitable for the intended use of the presently claimed invention. As shown by Table 1, the 0.5 μ m copolymer particles of Blunt et al. have a viscosity of greater than 10,000 mPa·s. Such a high viscosity prevents coating as measured by bar coater and gravure coater.

Table 1

Correlation between particle diameter
and viscosity of dispersion

| Particle diameter (μ m) | Viscosity (mPa·s)@25°C |
|------------------------------|------------------------|
| 0.5 | >10,000 |
| 3 | 2,000 |
| 10 | 80 |
| 15 | 10 |

Solvent: toluene
Solid content: 10%

On the other hand, the dispersions coated by bar-coater or gravure-coater within the particle sizes of the present invention have a viscosity within the preferred range of 10 to

300 mPa.s. The high viscosity of the particles of Blunt et al. makes it impossible to coat the resin onto an adherent and is therefore unsuitable for the intended purpose of the presently claimed invention. Thus, Blunt et al. would not have provided any suggestion or motivation to a person of ordinary skill in the art seeking to make an adhesive having excellent low-temperature, heat-sealing properties which can be used as an adhesive for polyolefins, and particularly that for polyethylene.

Applicants also maintain that the presently claimed range of crystallinity of less than 30% is a non-obvious range of a broader disclosed range. Although Blunt discloses the extremely broad range of a crystallinity of 90% or less, the presently claimed range of less than 30% unexpectedly results in a graft modified ethylene/ α -olefin random copolymer having a melting point of not higher than 90° C while having high adhesion strength. This unexpected combination of low fusion temperatures and high adhesion strength allows for a film made from the copolymer to be heat sealed at low temperatures.

In contrast, known resins such as those shown in the Table at col. 14, lines 1-10 of Blunt et al., all have heat sealing

and fusion temperatures that are **twice** the melting temperature of the presently claimed resins e.g. fusion temperature at 180° C. The unexpectedly low heat sealing temperature along with unexpected adhesion strength of the presently claimed invention clearly rebut an alleged *prima facie* case of obviousness. As the Federal Circuit clearly stated in In re Chupp, evidence of superiority of a property that the claimed composition shares with the prior art can rebut a *prima facie* case of obviousness. 816 F.2d 643, 646, 2 U.S.P.Q.2d 1437, 1439 (Fed. Cir. 1987). Furthermore, the Federal Circuit clearly stated that "a greater than expected result is an evidentiary factor pertinent to the legal conclusion of [non]obviousness". In re Corkill, 711 F.2d 1496, 266 USPQ 1005 (Fed. Cir. 1985).

Roberts and Tomita also fail to provide any suggestion or motivation to make the claimed limitations. Roberts only discloses a reaction of a polymer having ethylenically unsaturated bond with a chain-transfer agent in the presence of a free radical while Tomita solely discloses a functionalized polymer obtained by oxidation or sulfonation of terminal double bond, or by addition reaction of functional group containing compound to double bond. Further, the unmodified polymer of

Tomita is C₃₋₂₀- α -olefin polymer whereas the present invention relates to the completely different ethylene/ α -olefin copolymer.

Applicants note that claimed limitations are not mere optimization of results effective variables because one of ordinary skill in the art would not have expected that the claimed range of crystallinity of less than 30% coupled with intrinsic viscosity (η) as measured in decalin at 135°C in the range of 0.2 to 5.0 dl/g, particle diameters measured by a Coulter Counter of 5 to 50 μ m and a polar monomer graft component in the range of 0.1 to 15% by weight would result in a low temperature heat sealing resin composition or film having high adhesion properties. In other words, the cited references fail to teach that optimization of intrinsic viscosity (η), particle diameters, crystallinity and polar monomer component give rise to lower heat fusion and melting characteristics while maintaining high adhesion strength. See In re Antoine, 195 U.P.S.Q. 6 (C.C.P.A. 1977).

Applicants further note that these limitations are not merely newly discovered properties nor are they inherent to the teachings of Blunt, Roberts or Tomita because a person of ordinary skill in the art would not have been able to make the

claimed invention from the references alone without undue experimentation. United States v. Telectronics, Inc., 8 USPQ2d 1217 (Fed. Cir. 1988).

But even if an allegation of *prima facie* case of obviousness is maintained, Applicants rebut that presumption with evidence that the presently claimed limitations unexpectedly result in improved low-temperature heat-sealing properties. As shown in Comparative Example 1 of the present specification, the low-temperature heat-sealing property of known ethylene/1-butene copolymers are clearly inferior to those of the presently claimed modified copolymer.

For example, Table 1 on page 103 of the specification shows that copolymers not within the presently claimed molar ratios have far inferior adhesion strengths. At 100° C, the low temperature sealing property for Comparative Example 1 is only 50 g/15mm whereas the presently claimed Example 1 has a **500%** increase in adhesion strength of 250 g/15mm. This is clearly an unexpected result not contemplated by the prior art. One of ordinary skill in the art would not have been motivated to make the claimed invention based on the teachings of the cited references. The unexpectedly superior advantage of low

temperature heat sealing and high adhesion strength rebuts any allegation of *prima facie* obviousness.

Accordingly, Applicants respectfully submit that the presently claimed invention is non-obvious over Blunt in view of either Roberts et al. or Tomita et al. and respectfully request reconsideration and withdrawal of the rejections of claims 1-14 under 35 U.S.C. § 103.

2. Rejection of claims 15 and 16 under
35 U.S.C. § 103(a)

The Office Action rejects claims 15 and 16 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 3,475,369 ("Blunt"), U.S. Patent No. 3,328,362 ("Roberts et al."), and U.S. Patent No. 5,252,677 ("Tomita et al.") as applied above in paragraph 3, and further in view of JP 63-378 ("Akazawa et al."). The Office Action states:

Blunt, Roberts, and Tomita et al. teach all of the limitations in claims 15 and 16 except for a specific teaching of using maleic anhydride as the polar monomer. However, it is noted that Roberts generally teaches using anhydride as the polar monomer (column 3, lines 26-27), Blunt as modified by Roberts or Tomita et al. are not limited to any particular polar monomer, and maleic anhydride is a well known polar monomer used in graft polymerization of copolymers such as those taught by Blunt. One of ordinary

skill in the art at the time the invention was made would have readily appreciated using as the polar monomer taught by Blunt as modified by Roberts or Tomita et al. maleic anhydride as maleic anhydride is a well known polar monomer used in graft polymerization of olefin copolymers as shown for example by Akazawa et al.

Akazawa et al. are directed to graft polymerization of an olefin resin with a monomer such as maleic anhydride to increase the adhesiveness of the resin (see Abstract).

Applicants respectfully traverse the rejection for the same reasons as given *supra*. Since the claims 15 and 16 depend from the independent base claims and thereby incorporate all the limitations, the same arguments made over the independent claims 1 and 7 are applicable to dependent claims 15 and 16. In particular, independent claims 1 and 7 recite a graft modified ethylene/ α -olefin random copolymer having a particle diameter measured by a Coulter Counter of 5 to 50 μm . None of the cited references teach a particle size limitation within the claimed range and instead teach much smaller diameters of 0.02 to 0.5 μm . See Blunt at col. 1, line 14.

Furthermore, the presently claimed range of crystallinity of less than 30% in the base claims is a non-obvious range of a

broader disclosed range. Although Blunt discloses the extremely broad range of a crystallinity of 90% or less, the presently claimed range of less than 30% unexpectedly results in a graft modified ethylene/ α -olefin random copolymer having a melting point of not higher than 90° C while having high adhesion strength. This unexpected combination of low fusion temperatures and high adhesion strength allows for a film made from the copolymer to be heat sealed at low temperatures.

In contrast, known resins such as those shown in the Table at col. 14, lines 1-10 of Blunt, all have heat sealing and fusion temperatures that are **twice** the melting temperature of the presently claimed resins e.g. fusion temperature at 180° C. The unexpectedly low heat sealing temperature along with unexpected adhesion strength of the presently claimed invention clearly rebuts an alleged *prima facie* case of obviousness.

Since all the independent claims are unobvious over the primary reference, the dependent claims 15 and 16 are similarly unobvious.

Accordingly, Applicants respectfully submit that the presently claimed invention is unobvious over the cited